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SCIENCE AND TECHNOLOGY

No. 158

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WEST EUROPE REPORT

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BIOTECHNOLOGY

FRENCH SEEK 10 PERCENT OF WORLD BIOTECH MARKET

Paris LIBERATION in French 6 Sep 83 p 18

[Excerpts] The rise in biotechnologies has taken place up to now without France or at least nearly so. Nevertheless French fundamental research is performing well. It remains to ensure that its benefits are passed on to industry.

Bio Expo 83: "Discover the biotechnologies." Rarely has the theme of an exposition been so appropriate. In France the cumulative delay in this area might well appear disturbing enough and it is now necessary to redouble our efforts to catch up to the United States and Japan. In the latter country the state decided to finance industrial research programs in 1971 and since then an annual budget of 50 billion yen has been allocated to them. The equivalent of 1.2 billion francs, every year for 12 years. Thus it really is time to "discover the biotechnologies" in France. It is generally estimated that the world market for biotechnologies is today somewhere in the vicinity of 140 billion francs and that it will be 250 billion in 1990....

Last year a great official offensive was observable in the bioindustry sector. This was very clearly reflected by the publication in the official journal of a text entitled "Incentive Program for Growth in Biotechnologies." That was in July 1982 and gave rise to a flurry of diverse reports and texts all emphasizing the fact that if France wanted to capture 10 percent of the market in 1990 (the French share is currently a scant 7 percent), it would be necessary for all resources to be mobilized and, above all, coordinated. Our country's traditional trump cards in this handicap race are classical. In the first place we know that we have at our disposal a fundamental research capacity of high quality. The problem is that there are only 800 researchers at the present time in this area (including both fundamental and applied research) and that about 2,500 will be needed by 1985 to be really competitive. As for the industrial base capable of developing this sector we can count on an already up-to-date agro-alimentary industry: 30 percent of its turnover comes from operations utilizing micro-organisms, enzymes and cells. The chemical industry--with Elf-Sanofi and Rhone-Poulenc--has also established itself in this sector with a turnover in biotechnology for these two enterprises of close to 6 billion francs.

Up to now there has been a lack of substantial financial commitment by the state. Now it would appear that, with 1.4 billion francs in various incentives budgeted in 1983k this situation has been corrected. The only thing that is left is the essential item: coordination. First, on the international level, Laurent Fabius yesterday inaugurated the "international network" for this pur, ɔse. It was proposed by one of the working groups created at the Versailles summit. The liaison between research and French industry (always a delicate matter), is the crucial point of the plan. Here the minister for research and industry laid--and rightly so--the cornerstone of a somewhat special bridge. According to the Pasteur Institute what this prestigious organ needed to collaborate efficiently with the industrialists was indeed a building. However strange it may seen, this wish has been granted. All the researchers of the institute working on biotechnologies will be able to be in the same building which will cost 83 million francs and will be finished in 1986. When the industrialists wish to collaborate with the researchers at the institute they will have one bell to ring.

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FRENCH IMPROVE INFRASTRUCTURE FOR BIOTECH RESEARCH

Paris LIBERATION in French 6 Sep 83 p 18

[Excerpt] Minister of State for Research and Industry Laurent Fabius yesterday inaugurated construction of a "Biotechnologies Building" at the Pasteur Institute and announced the creation of an "international network of biotechnologies" centered in France and Great Britain.

Bioexpo 83 was rather disappointing. There was not very much to be seen but it must be said that the biotechnology is not really visual....

In front of the expo building, Minister Fabius manipulates a trowel under the indulgent eye of some hundred people. Laying a cornerstone is always an emotional moment. And it is difficult to know if the researchers of the Pasteur Institute who are watching from their windows see in the future building a gauge of the importance accorded their work or a threat to the view which is already quite obstructed by the cluster of buildings. "The construction project for a biotechnologies building at the Pasteur Institute is one of the key elements in the basic program 'biotechnology progress,'" according to Francois Jacobi, managing director of the Pasteur Institute. The other key element is the "international net work of biotechnologies" whose establishment was announced by Laurent Fabius a few minutes earlier.

The project is an outgrowth of the group created after the Versailles summit of industrialized countries and called "Technology, Growth, Employment." Piloted by France and Great Britain, the plan for an international network of biotechnologies was ratified at the Williamsburg Summit. Goals: to assist in the training of students of developing countries and to develop cooperation in the sphere of fundamental research. The areas involved range from vaccines to new varieties of seed. International cooperation, which includes the other industrialized countries as well as Great Britain and France (two countries in the forefront of fundamental research), should be a "source of progress and reciprocal confidence of importance to the countries of the North as well as those of the South," if the minister is to be believed. And, of course, in this hommage to cooperation, the minister does not forget the traditional hymn of Europe: "Euroresearch is one of the great avenues of the future."

True, but remember that tomorrow's society will be "based on what we still call the technologies of the future," including biotechnologies--and that is

not enough to define industrial policy. As for his policy, Laurent Fabius defines his policy along six [sic] broad lines: budgetary incentives for credits for biotechnologies which will encourage transfers to manufacturers with knowledge and techniques obtained by research organs; priority for bio-industries under the industrial fund for modernization which is to be implemented this month; establishment of data banks and gene banks; specialist training program--incentive policy at regional level. And it is difficult to find fault with those who would have preferred an aid program with fewer broad lines and more concrete promises. Laurent Fabius' final vow will no doubt suffice to eliminate uncertainty: "By uniting the energy with the means, by overcoming old divisions, we should be able to improve the deficit...."

Meanwhile, scientists coming mostly from industrialized countries are going to be called to the blackboard until 9 September at the Pasteur Institute on the occasion of the International Congress of Biosciences 83.

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FRENCH INDUSTRY INVOLVEMENT IN BIOTECH GROWING

Paris LIBERATION in French 8 Sep 83 p 13

[Article by Dominique Leglu]

[Excerpt] In France some companies supported by government credits are already trying to pass from research to the industrial sector: Transgene at Strasbourg, for example, which makes use of work done in the laboratories of the CNRS [National Center for Scientific Research] and in laboratories of the Louis Pasteur University. Some companies like Russel-UCLAF or Elf-Aquitaine are also investing in biotechnology.

Another domain which is richly promising both on the research level and on the level of industry is the fusion of cells. Since 1960 at Villejuif (at the Laboraotry for Virology and Tissue Culture in the Gustave-Roussy Institute) a team has observed the formation of a new type of cell in the course of experiments involving the common culture of two lines of mouse tumor cells. Since then this observation has borne fruit; in particular the scientists came to realize that in producing the fusion of a cancer cell with a cell producing antibodies they had obtained hybrid cells, called hybridomes capable of synthesizing a great variety of antibodies. One may well imagine all the possibilities offered by the latter in the fight against cancer or against parasitic diseases. The Americans, always prompt to transfer research ideas into the public domain and more particularly into the commercial domain are already announcing rather juicy cash figures in this sector [2].

According to financial circles on the other side of the Atlantic the sale of diagnostic kits using monoclone antibodies could amount to $500 million in 1987 and the sale of cancer cell detection tests could exceed $2 billion in 1990. In France Immunotech (founded in 1981 and based upon research at INSERM) and Hybridolab (Institut Pasteur) are at the present moment attempting to snatch a part of this sophisticated cake at the top of the biotechnology spectrum.

At the Biosciences 83 Exposition which is currently taking place at the Institut Pasteur the more classic aspect of such biotechnology is nevertheless not being disdained. Take, for example, the endowment granted by Paribas to a young woman student in microbiology to carry out research in the United States in oenology--in other words in wine science. Dionysos has reason to

be happy; all the chaptalisations and other wholesale methods of improving wines must soon take a back seat to the repeated efforts of good familial strains of yeast or of bacteria. According to the most recent news about such strains, for example, it has been possible to isolate "Saccharomyces uvarum," capable of eliminating the abnormal formation of foam at the start of fermentation; this is a common problem which no longer affects California "burgundies."

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FRENCH SEEK TO COORDINATE BIOTECHNOLOGY RESOURCES

Paris BIOFUTUR in French Apr 83 pp 42-43

[Article by France Normand-Plessier]

[Text] The Mobilizing Program's national committee met for the first time on 31 January, chaired by Jean-Pierre Chevenement, minister of research and industry. The group's vice chairman is Pierre Douzou. This committee is responsible for the monitoring, evaluation, and orientation of the program (see BIOFUTUR, Sep 82, p 28).

Will We Be Able to Catch Up in Bio-Industry?

The strong surge in biotechnologies is not related solely to genetic engineering and cellular fusion. In France, microbiology has been neglected: the "banks" of micro-organisms are poor and scattered, fermentation technology has not kept up with the progress made abroad. This situation has been caused by the lack of a body of scientists and engineers capable of bringing about progress with these tools, of transferring knowledge and technological skills to the business community, which is itself inadequately motivated and equipped. Therefore, industries are handicapped in relation to the industries of most of the developed countries. The Biotechnologies Mobilzing Program wants to motivate this research body and assign it the responsibility to make full use of the progress made in cognitive research, by linking this progress to "strategic facts" which can be converted to technological skills resulting in innovation. But this intention will not become a reality if the conditions for this conversion are not created: personnel must be mobilized and a biotechnological infrastructure must be created.

For some years, scientists in research organizations have been aware of the role they can play in the early phase of biotechnology, and we are now finding motivation for a real dialogue.

It is certainly time for this to happen, for such a priority item had been proposed in the 7th plan in 1975! And yet, there are still too few scientists and engineers engaged in using the results of basic research. It is a fact that this type of research is a relatively thankless task, and it is not viewed with much favor in research organizations. And finally, the multidisciplinary approach, which is essential for true innovation, is rarely present in engineering schools, and is found even less frequently in universities.

According to Professor Pierre Douzou: "If the program's staff does not manage to arouse this motivation and to create a biotechnological interface, our research efforts and our businesses will each pursue, separately and independently, their quest for academic laurels and a meaningless dream of innovation, giving us no control over our fate."

Who are the People in Charge of this Program, and What Will They Do?

The following persons are members of this committee:

Representing the ministry of research and industry: Messrs R. Morin, L. Gallois, and R. Chabbal.

Representing other ministries: agriculture: Mr Lucas; health: Mr Dangoumeau; national education: Mr Weil; budget: Mr Gamby.

Representing research organizations: Mr Frejacques: CNRS [National Center for Scientific Research]; Mr Lazar: INSERM [National Institute of Health and Medical Research]; Mr Dedonder of the Pasteur Institute; Mr Poly: INRA [French Institute for Agronomical Research]; and Mr Pecqueur: CEA [Atomic Energy Commission].

Representing trade union and professional organizations: E. Joromanoff: CFDT [French Democratic Confederation of Labor]; J. Guerin: CFTC [French Confederation of Christian Workers]; D. Tavard: CGT [General Confederation of Labor]; G. Fosse: CGT-FO [Workers Force]; Ms A. Jacq: FEN [National Education Federation]; Mr Torck: CGC [General Confederation of Managerial Personnel]; Mr Fillet: CNPF [National Council of French Employers]; Messrs Sicard and Pomportes: CGPME [expansion unknown]; Mr Grideray: FNSEA [National Federation of Syndicates of Farm Operators]; and Mr Jouve: CNJA [National Young Farmers Center].

Other members: Messrs Pierre Chambon (Strasbourg); Jean Dausset (Saint-Louis Hospital); Francois Gros; Alain Guy (Lafarge Coppee); Michel Horps (Credit Agricole); Robert Lattes (Bank of Paris and the Netherlands); Michel Lavalou (Rhone-Poulenc); Jean-Claude Pelissolo (CDF-Chimie [French Coal Board-Chemical Division]); and Romeo Roncucci (Sanofi).

The secretary general of the mobilizing program is Mr. G. Paillotin and the program's executive secretary is Mr G. Durand.

Five working groups have now been created:

1) Technological monitoring, followup, and evaluation of the program;

2) Public and private financing of research and technological development;

3) Training of specialists and labor (in close cooperation with the ministry of national education);

4) Employment, safety, and regulations; and

5) International cooperation.

Basic Research

Each organization has chosen topics of interest and has been allocated a budget which takes into account the diversification effort. Moreover, program contracts providing supplemental funding have been proposed.

a. With the CNRS, three topics have been selected: a study of the conditions for the production of molecules of biological interest from cloned genes; research on new vectors and new receptor cells; and micro-organisms of biological interest.

b. With the INRA: plant genetic engineering, micro-organisms of industrial interest, biopesticides, cloning and sequencing of milk protein genes and their location, monoclonal antibodies for veterinary medicine, protease and enzymatic engineering, training.

c. With the Pasteur Institute, the program contract will cover a variety of activities by laboratories working in areas of biotechnology: health (vaccines produced through genetic

engineering, dosage and diagnosis, vectors, neurobiology); microbiology (cloning of genes in Bacillus subtilis, bio-insecticides, methylotrophic bacteria); chemical technologies applied to genetic engineering (syntheses of peptides and of oligonucleotides); training.

d. With the INSERM, this cooperation will concentrate on topics of interest in genetic engineering and in human and animal genetics; immunology (monoclonal antibodies, etc.), and basic research in biomedical biotechnology. This support will be used particularly for the purchase of specialized equipment (HPLC [expansion unknown], cell sorters, etc.), for computer systems applied to genetic engineering and enzymatic engineering, and for travel funding.

Logistic Support

For the past 3 years the program staff, in conjunction with the MIDIST [Interministerial Mission on Scientific and Technical Information] and the CODIS [Committee for the Development of Strategic Industries], has been trying to improve access to data banks and to biological specimen banks.

a. A national data bank on the sequences of nucleic acids is being created in cooperation with the European bank in Heidelberg.

b. Biological specimen bank: The Pasteur Institute is responsible for the national collection of micro-organisms. It has been decided to set up a catalog listing the collections existing in France, and to create a data bank which in the beginning will cover a limited number of organisms.

c. Conservation of strains (fungi and plant cells). A survey has counted about 15,000 strains of fungi in 67 public laboratories. There is a serious problem just in conserving these strains. The head of the project will probably be from industry and the participants will be the Museum, the Pasteur Institute, and the INRA. This project will be extended to cover methods of cryo-cleaning applied to plant cells, tissues, and organs (Paris VI University and the CNRS).

Program Contracts for Specific Topics

Clearly identified projects with recognized priority will be directly implemented by the program staff. Public research laboratories and industrial laboratories are taking part in these projects.

a. Microbial polyosides: sifting of strains, study of products, improvement of the production of the products chosen.

b. Enzymology and enzymatic engineering. The CNRS is to make some proposals. At the same time, a project headed by a representative of industry is in the proposal phase.

c. Nitrogen fixing: the clustering of public laboratories around the GIE [Economic Interest Group] established 3 years ago with ELF, EMC [Mining and Chemical Enterprise], Pasteur, and the INRA.

d. Fermentation: the formation of a GIP [Professional Interest Group] between four French laboratories and an industry is being considered.

e. Improvements in wine stock. France is behind the United States and Australia in this area. At the initiative of Moet-Hennessy, three university laboratories and one INRA lab have joined together.

What About Bio-Industry?

Some operations studied in cooperation with the CODIS and ANVAR [National Agency for the Valorization of Research] have already led to the creation of biotechnology companies such as Immunotech, Transgene, Hybridolab, and recently, Clonetech. A small reagents company (Biotechnika) had been supported by CODIS in 1982, but it has just filed for bankruptcy. A market study and the commercial network had not been given sufficiently close attention.

Other more industrially oriented actions have helped to support or will aid the development of new research in large nationalized industries, such as Elf, Sanofi, Rhone-Poulenc, Roussel Uclaf, or private companies such as Claeys-Luck, Clause, BSN [expansion unknown], and Protex.

Paralleling these new developments, the French Energy-Saving Agency is continuing to support operations in the areas of depollution, methane, and new energy sources (ethanol, acetonobutanol, etc.).

Finally, we should also mention the activities of some banking groups (obviously including Paribas (Bank of Paris and the Netherlands), but also Credit Agricole, the Societe Generale,

Credit National, etc.), and some innovative "risk capital" companies which have a significant involvement in biotechnology, also in cooperation with industrial and government projects. We can mention in this area Biosys, France Embryon, Germe, and Transgene (already cited).

Therefore, it seems that all of these partners are now aware of the importance of this field. The international competition is terrible, and we must not only catch the train on time, but also have enough resources to back up what we are doing. This will be a hard-fought battle.

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FRENCH-BRITISH COOPERATION DESCRIBED

Paris BIOFUTUR in French Apr 83 p 41

[Text] At the Versailles summit conference, the heads of state set up a working group, "Technology, growth, employment"*. This group has proposed 18 projects for international cooperation. France, along with Great Britain, will set up the International Biotechnologies Network. Canada, Japan, Italy, the European Communities, and the United States are interested in this project and will take part in the development of the network.

Objectives

The Franco-British project has three major objectives:

a. To help to train students in the developing countries;

b. To promote cooperation in basic research through the coordination of national research programs and the development of specific cooperation projects.

c. To set up an international structure to establish common rules of conduct and to prepare common standards of evaluation, particularly in the area of the safety of new products arising from biotechnologies.

The project has also proposed a certain number of secondary objectives, including:

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* This group is chaired by Jacques Attali, assisted by Francois Gros. The secretary general is Yves Stourdze, director of the Institute on the Future Prospects of Science and Technological Forecasting of the CESTA [expansion unknown].

a. To improve access by the developing countries to scientific data and to research programs in the developed countries.

b. To develop certain research, either basic or applied, which has been somewhat ignored, or which requires very expensive long-term investments, or which deals with specific products for a limited market. In this context, the working group has accepted the Canadian proposal on "orphan drugs," that is, pharmaceutical products which have never been manufactured industrially, or which have been taken off the market, because they are used to treat diseases which are considered rare.

In this project, France will house the executive secretariat of the International Biotechnologies Network, which will handle the establishment and coordination of programs and the dissemination of information.

Context

The Franco-British project is one of a number of existing networks (International Bioscences Network, MIRCEN [expansion unknown] network, etc.), and of training activities conducted by a variety of international organizations (ICRO, EMBO [expansions unknown], as well as international projects to create a Genetic Engineering and Biotechnologies Center (UNIDO [United Nations Industrial Development Organization] project). It differs from the above projects, however, in several ways.

Unlike the existing networks, which are more oriented toward biology, the Franco-British project is definitely oriented toward biotechnologies, and will give the developing countries greater access to these technologies, which so far have been "reserved" almost exclusively for the industrialized nations. This is actually a network based on existing centers and programs, and not a single center. It responds to a pressing need for cooperation in basic research--useless duplications waste national resources--and to a need to train students in the developing countries.

The UNIDO project is both highly ambitious and very expensive. It calls for the creation of a new research center, primarily oriented toward genetic engineering. The cost of equipment for this center, not including the buildings, is estimated at $9.5 million. The cost of operating the UNIDO center is estimated at $29 million for the first 5 years.

On the contrary, the Franco-British project is economical for it is broadly based on existing centers and programs. It promotes the coordination and development of high-level research on an international level and reinforces current efforts of training centers in favor of students from the developing countries, to whom it will offer research-training courses on problems of interest to their home countries. The creation of an international coordination committee should also provide an opportunity for in-depth reflection about the development of common rules for the evaluation of the safety of new products created by biotechnologies. In conjunction with international organizations, it will help to identify needs, for example health needs, which are now being overlooked.

Development Synergy

This project, which is very open as well as being realistic and clearsighted, offers above all the advantage of not arbitrarily separating the functions of training students from the developing countries, international cooperation in basic research, and cooperation in areas which have either been ignored or poorly explored to date. The joint development of these three levels of activity by the International Biotechnologies Network should help to create a true research-training synergy, which will benefit both the developing countries and the developed countries in a sector which in years to come will have an important social and economic impact.

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BRITISH PLANNING BIOTECH STRATEGY

Paris BIOFUTUR in French Jul-Aug 83 p 18

[Text] Creation of a think tank in the Department of Industry.

Three experts from industry (BP, Glaxo, and ICI) are going to work for the Department of Industry for two years. Their role will be to determine a national strategy in biotechnology, needed in the United Kingdom: identification of needs (e.g., manufacture of enzymes) and establishment of priorities. These nominations are due to an initiative of Dr Coleman, who is at the head of the "Laboratory of the Government Chemist" and is the Department of Industry chief for biotechnology. One of their first tasks will be the selection of projects from the requests for assistance (financial and market studies) which have ensued from the announcement of the Department of Industry program in November 1982 (16 million pounds sterling). The group believes that the most profitable applications will probably not be those aimed at commercialization of products but those providing for energy economy--shortening synthetic processes, etc. A list of the main recent investments is provided. (Sources: French Embassy in London: FINANCIAL TIMES, 18, 25, 26, 28 April 1983; Biotech 83)

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BANK DRAWS PRIVATE FUNDS INTO BIOTECHNOLOGY

Paris BIOFUTUR in French Jun 83 p 59

[Article by L. Faibis]

[Text] The CCF Conferences on French Technology

It is not enough to discover; one must finance at the appropriate time: this could be the lesson to be drawn from the two conferences devoted to French technology and organized by Credit Commercial de France on the 14th and 15th of last April. Fifteen French groups, among the most dynamic in front-line technology, have entered into dialogue with an audience composed of both French and foreign investors.

Biotechnology has for a long time been looked upon with prudent curiosity by French financiers, in perplexity when confronted by these new techniques for which they possess no yardstick to measure their economic importance, and uneasy when confronted by the magnitude of research investments which are necessary and by the uncertainty of their profits. Therefore one must hail the efforts of the CCF to attract into French biotechnology that private capital which up to now has been scanty. In this connection people here are awaiting impatiently fiscal measures to encourage the development of risk-capital companies in France.

Faced by an attentive audience, a large number of whom were present in order to discover biotechnology (as shown by the success of the very didactic film presented by Mr Le Hodey, representative of Lafarge-Coppee), the industrialists who animate the conference continue to speak of projects and strategies.

Mr Guinot, adjoint director of Rhone-Poulenc Sante, has emphasized the importance which according to him attaches to the assignment of funds to play a decisive role in biotechnology on the world scene. Rhone-Poulenc which is in the process of bolstering itself by absorbing the Pharmuka Company already controls the world's third largest fermentation capacity, a fact which places them at the head of French biotechnology throughout the world.

The case of Moet-Hennessy, the number one champagne firm, is quite different. Initially constituted around a luxury item the group subsequently moved toward perfumes (Dior), cognac, beauty products (Roc), all of these being products which have in common a reputation for prestige and quality. But too

often one has perhaps forgotten another common denominator in the diverse activities of this company: their bioindustrial character. From this point of view one can understand the fact that Moet-Hennessy has participated in the initial financing of Transgene, and one can understand its recent orientation toward horticulture in its taking control of Armstrong Nurseries in the United States and its participation in the Delbard Company in France--both of them important producers of roses.

Diversification--this is a strategy which Jean-Francois Dehecq, general director of Sanofi, applies readily to biotechnology. Therefore no one will be surprised to see both Institut Pasteur Production and the Entremont Cheese Company both coexisting in the portfolio of activities of the pharmaceutical affiliate of Elf-Aquitaine.

New technologies, original strategies and specific financing problems: it is imperative that the dialogue opened up at the CCF colloquium shall continue to instruct investors and the industrialists of biotechnology to better understand one another. And so one must hope for a renewal of this type of initiative, which in France has occurred for the first time ... but which is already common practice in the United States.

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DUTCH COMMISSION APPROVES GENETIC RESEARCH

Amsterdam ELSEVIERS WEEKBLAD in Dutch 27 Apr 83 p 9

/Article by Willem Kraan: "Netherlands Is The "Staphorst' (very conservative, religious town) of Science"/

> /Excerpts/ Last week the "broad" DNA commission presented its final report to Minister Deetman. The conclusion reads: Nothing the matter, quickly proceed with the once so sensational DNA recombination technique. A number of researchers can now breathe more freely again, among them Dr Huub Schellekens of the TNO /Netherlands Central Organization for Applied Natural Scientific Research/ Primate Center.

Not Unanimous

The conclusions of the broad DNA commission are not unanimous. The representative of the Association of Scientific Workers, Dr J Jelsma, cannot resign himself to the "nothing the matter." The difference in opinion mainly stems from differences in philosophy of life and science. Jelsma also states that little new knowledge about the risks of DNA recombination research has been collected since 1974. That surprises Schellekens:

"Jelsma has to keep up with the literature. In our research we investigated, for example, the infectiousness of the hepatitis-B virus. It appeared that chimpanzees could only be infected by injecting the whole new DNA into the liver. So, real effort must be made to bring about an infection. For we only use a part of the DNA."

/Question/ An often-heard objection against this type of research is the possibility of creating new species and interfering with the evolution. That is a realistic objection, isn't it?

/Answer/ "No, not at all. That is also one of the reasons why we are so happy with the report. A clear distinction is made between the present technique and intervening in impregnated germ-cells. There are no "Boys of Brazil." And they will not come either. You must realize that we have already 3 billion years of evolution behind us. All possible DNA combinations

have already occurred some time, and most of them have also disappeared again. Even right now all sorts of things go wrong spontaneously in our cells. One hour of sun-bathing causes more spontaneous DNA mutations than a molecular biologist can accomplish in his whole life."

/Question/ But the molecular biologist works with a specific purpose in mind, and, therefore, has more chance to succeed.

/Answer/ "Did you think so? In a laboratory some work is done without a specific purpose in mind. To make a rat clone one must find one cell among 750,000 cells of the same kind."

/Question/ In the report a distinction is made between the different risk ratings and their curtailing regulations. At TNO in Rijswijk a laboratory with a next to the highest risk rating is under construction. What type of experiments can be done in such a C-III laboratory?

/Answer/ "Such a laboratory is needed if, for instance, one would want to build a recombined DNA into a typhoid bacterium. But do not imagine that too dramatically. There are also people around who continuously secrete typhoid bacteria, and that does not do any harm either. Because the curtailment requirements have been relaxed somewhat over the years, we do not really need a C-III lab anymore. But it is convenient if such a facility exists. If you need it, at least you do not need to apply for a public nuisance act and building permit. Besides, other experiments can be carried out also and we did need space for those."

/Question/ Defense research is also carried out at TNO in Rijswijk. Can the C-III lab also be used for that?

/Answer/ "No, those are separate affairs. Here, defense research is only carried out by civilians. So, the danger of new doctors Strangelove, who let a typhoid bacterium escape, is completely imaginary. Besides, it would not be of much use to a war-minded person. If you put the 10 smartest heads in the world together with the instruction to make a biological weapon, then they will not be able to find anything worse than what nature already has available. Take the botulism virus for instance. Very perilous!"

/Question/ What about the vision where heriditary characteristics like athletic ability and intelligence are manipulated?

/Answer/ "Nonsense. We do not even know exactly which factors determine intelligence and athletic ability. Genetic selection works much better. That is what they do in East Germany. Putting an athletic father and mother together is very common over there. Sometimes we say, when we are in a funny mood: If we want to become rich, we will clone the fortune albumen. That is just as nonsensical."

/Question/ Biogen, where the hepatitis-B vaccine was developed, is not a Dutch firm. Will there be one now?

/Answer/ "When in 1978 we wanted to develop the vaccine at the primate center, it was not allowed. Therefore, we had to go to Biogen and thanks to them we have been able to keep up with the technique. Because of that type of limitations TNO and money-lenders started to have their doubts and we are now commercially clearly behind compared to other countries. They hesitated too long in The Netherlands. We are the Staphorst of science. In order to catch up, we think that the government should now put money into a Dutch biotechnological firm. Wagner also said that it should become a "spear-head technology. Besides, that money is needed to get the talented people back who ran away. An example? The director of a French biotecnological firm is a Dutchman. A brilliant guy. It is a downright shame."

Beer-yeast

/Question/ What kind of results can we expect from the DNA recombination technique the first few years?

/Answer/ "The fruit fruits will undoubtedly be borne by the medical sector. There will be new vaccines against virus diseases like influenza and polio. We can also think of making messenger albumen now with which defense mechanism disorders can be treated. Besides, it will be possible to make hormones like insulin and growth-hormone as well as dianostic remedies for hereditary diseases. In the food industry this technology is not really new. Beer-yeast has been manipulated for centuries. But for psychological reasons there is little information about it, because Heineken would not taste so good anymore."

12433
CSO: 3698/434

SEMICONDUCTOR PRODUCTION, APPLICATIONS IN SWITZERLAND

Bern TECHNISCHE RUNDSCHAU in German 1 Mar 83 pp 21, 23

[Article by Peter Schwob and Hanspeter Wild: "Swiss Involvement in the Semiconductor Industry"]

[Excerpts] The semiconductor vendor's market takes place in an international arena; a genuinely local Swiss market simply does not exist. Several small- to medium-sized vendors cover the demand of a few medium-sized firms (oligopoly or oligopsony). If one considers that the few semiconductor factories in Switzerland cover the international market and in total only about Fr 20 to 30 million flow in to the domestic vendors, it becomes clear that even they have to orient themselves more strongly to exports.

Switzerland's Leading Role in Technology and Design of Extremely Low-power ICs

In contrast to the large number of users, the number of manufacturers of semiconductor components is limited. This is due to the simple fact that the required infrastructure for manufacturing semiconductor components is so expensive that only large industrial firms can afford the needed investment. In the United States the situation is more favorable in that risk capital is easier to acquire there.

Figure 2 shows the geographic distribution of the firms and research operations which constitute the Swiss semiconductor industry:

two autonomous manufacturers of integrated circuits (CMOS) with an output of about 40 million circuits per year: Faselec of Zurich and MEM of Marin

One autonomous manufacturer of CMOS [Complementary Metal-Oxide-Semiconductor] OEM [Other Equipment Manufacturer] circuits; about 100,000 pieces annually: CEH/PSRM of Neuenburg

two thyristor manufacturers: BBC of Lenzburg and TAG Semiconductors of Zurich

one manufacturer of bipolar MSI circuits and semicustom analog ICs (small lots): FAVAG of Bevaix

six design centers: Motorola of Geneva; HMT microelectronics of Bruegg (gate arrays, semicustom modules); Fela, of Thundorf (gate arrays, semicustom ICs); Crossmos of Marin (gate arrays, semicustom ICs); Landis + Gyr of Zug (semicustom ICs for in-house consumption); Philips/Elcoma (Develec, in-house activities in cooperation with Faselec, full-custom and semicustom ICs)

research centers with activities in semiconductor electronics: BBC, IBM, RCA, Batelle and CEH/FSRM

Research and instruction in broad areas of microelectronics are pursued at both technical universities and in special fields at most other universities. In comparison to the international competition, primarily from the United States and Japan, the Swiss microelectronics industry is very modest. However, in the design and technology of extremely low-power integrated circuits, Switzerland plays a leading role. The requirement for such products came about through the invention of the quartz watch, which in its fully integrated form represents a Swiss invention. It is of some interest to note that on the other end of the scale, Switzerland is a leader in research and development of power thyristors (silicon) for modern high-voltage equipment.

The Position of Swiss Firms in the Supplier Industry

Does a country far removed from the centers of the semiconductor industry have any chance at all of gaining a foothold in this branch?

Two companies with worldwide reputations from Liechtenstein provide the clearest answer! The Balzers Company, starting from a decade-long tradition in the manufacturing of vacuum equipment, has developed into an important supplier of vapor-deposition apparatus, sputtering equipment, ion implanters and, lately, plasma-etching equipment. Even more spectacular is the entrance of the firm Censor into the field of photolithography with a wafer stepper which was developed, so to speak, from scratch. Nothing speaks more highly of the success of this device than the fact that Perkin Elmer has taken over worldwide distribution of the Censor equipment as ancillary equipment for their projection illuminator. The Swiss take some satisfaction in the fact that Omega manufactures important mechanical components of the Censor equipment.

International competition in this branch of highly developed equipment (unit prices of about Fr 0.5 million) is extremely sharp; orders are placed only after comprehensive evaluation of all products on the market.

In Zurich diverse Swiss firms--old and established, pioneering, recognized struggling--are battling the foreign competition toe to toe in various technology areas.

Several of these companies will disappear from the picture just as fast as they appeared, but will usually soon crop up again in another market in a different form. A reason for this is the fact that few of them have the opportunity to design and build their equipment items jointly with the users. Often the distance to the user is too great for an exchange of experience

which is decisive for successful development. The domestic market is of course too small for the many equipment manufacturers. It is thus important that smaller companies worldwide have a niche, especially in the European market. In spite of the relatively large number of domestic manufacturers, only a few are direct competitors. In the broad spectrum of equipment, materials and services, Swiss industry covers only a fraction of the demand. Test equipment, for example, is built only in small quantities and then usually by the user himself. In the diffusion equipment sector, our industry (except for Balzers) is for practical purposes inactive. Only in the areas of assembly equipment and assembly materials are several companies successfully competing. They offer mainly wafer saws, die bonders and wire bonders, that is, equipment under manual, semiautomatic or automatic control. The recognition of optically acquirable structures on integrated circuits is accomplished in modern systems via video cameras. The picture is electronically evaluated and commands are sent to the mechanical parts of the machine. With this equipment it is possible to accurately align silicon wafers automatically and to cut 100-mm-diameter wafers into individual circuits with a saw-cut width of only 80 to 100 μm. With similar systems, correctly functioning circuits which have already been measured can be picked out of the yield of a wafer, accurately placed on the carrier material and soldered or bonded in place. Equally impressive is the precision of wire bonding. With gold or aluminum wires, the contact points of the IC (2 to 80 per circuit) are automatically joined to the carrier terminals at the rate of about 5 per second. The IC contact points measure about 0.01 mm^2. The design and operating requirements on such production equipment are extremely high.

The short useful life of such products (4 to 5 years) pushes the manufacturers to expend enormous effort to develop, design and produce rapidly the next generation of equipment in order to survive under the great pressure to innovate. This interesting and futuristic branch still offers a market potential for additional efficient, innovative and investment-ready companies.

In the area of electronically controlled mechanical equipment for assembling semiconductor components, the companies which have come through with a good name include Alphasen AG, ESEC SA and Farco. In the manufacturing of IC carriers and other important assembly materials, well-known companies such as Cicerol, Fela, Dr Mueller Fine Wire AG, Nivarox, Phillips and PPC have become established. A list of additional noteworthy examples is of necessity incomplete; however, it should convey an idea of the number of market segments covered: Approva Ltd. for bonding tools, Mettler Optics AG for masking materials, Peter Klaus Mueller SA for gas systems, Meyer and Burger AG for abrasive-disk cutting machines, Société Electrothermique de la Tour-de-Trême for quartz parts, Timesa for epitaxial reactors and Wild and Leitz AG as the manufacturer of microscopes and optical systems.

9160
CSO: 3698/421

STUDY SAYS MOST 1980'S INVESTMENT TO BE IN MICROELECTRONICS

Duesseldorf VDI NACHRICHTEN in German 19 Aug 83 p 14

> /Text/ Whereas investment for expansion and replacement will be declining in the 1980's, according to data by the Ifo-Institute for Economic Research in Munich, clear investment may well flow from the application of microelectronics. The new technologies can thereby not only lead to substantial increases in productivity, but also to capital-saving effects.

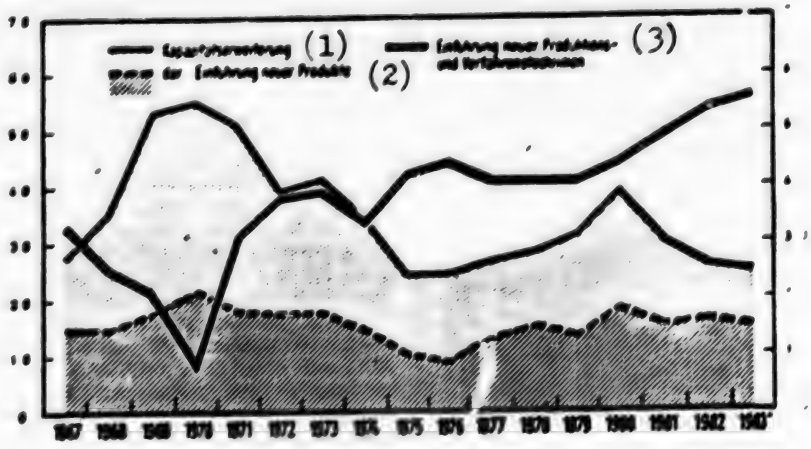
In all probability, only technological development will provide growth impulses in the 1980's. Whereas the Ifo-Institute for Economic Research in Munich expects demand for investment in expansion and replacement to decline in the coming years, it sees clear investment incentives in the transformation of technical progress into new products and services. Microelectronics in particular will provide numerous points of departure in the area of consumer goods and capital goods, as well as for improved products in office and communications technology. In this connection the economic research institute names, for example, motor vehicles with electronic auxiliary functions, industrial robots, NC /numerical control/ machine tools, Telefax /a facsimile service/, word processing and interactive videotex. "The development of new markets in the just-named fields, however, requires that technological progress in the area of intelligence transmission (glass-fiber technology, satellite technology) be transformed and especially that a new infrastructure be created through the establishment of a wide band communications network," asserts the Ifo-Institute.

According to the research institute, problems of acceptance could cause difficulties for these technologies. In a phase of high unemployment, the possibilities for increasing labor productivity would be especially alarming. But the new techniques also offer the chance to release capital-saving effects. Ifo cites office and data-processing equipment as examples. Because of the advance of the chip, this equipment has not only become more efficient but also considerably less expensive. "If the prices for this category of equipment had developed as had those for the products in mechanical engineering since 1970, then in 1980, instead of actually paying out DM8.8 billion for the procurement of these goods, DM15.5 billion would have been required," according to the Munich researchers.

Such capital-saving effects can also come about in the course of the further development of NC machines. In that way, there are possibilities for automatization of production in the area of medium and low-volume capital goods production. According to Ifo, the principle that the production of capital goods is especially labor-intensive would thus be refuted. The Munich researchers formulate this graphically as follows: "the industrial robot will bring about the fall in the prices for industrial robots."

The precise effects of this development on investment activity in the 1980's, however, are difficult to quantify. At any rate, according to the Ifo-Institute, if the modernization activity in the production of road vehicles or in the area of office machines and data processing is taken as a basis, then the potential for additional investment incentives is still great.

But risk capital must be available to apply the modern technologies. In view of the budgetary situation, one can hardly expect additional resources from the state. Of course it would be helpful, according to Ifo, if the existing tax advantages for investment in real estate and the promotion of homebuilding were restricted. In this way, these low-risk projects would be less attractive as an investment and the money could flow into an innovative application.



Investment to expand capacity has been declining in the FRG since 1980. Over 55 percent of the investment planned for and carried out in 1983 is for the introduction of new production and process engineering.

Key:

1. Capacity expansion
2. Including: introduction of new products
3. Introduction of new production and process engineering

9746
CSO: 3698/427

CIT-ALCATEL FINANCIAL PERFORMANCE, STRATEGY

Paris TEMPS REEL in French 4 Sep 83 p 6

[Article by D.C.: "CIT-ALCATEL, a Profitable Nationalization"]

[Text] With a consolidated business volume of 12.5 billion francs (a 15.9 percent increase) and a net profit of 113 billion francs (20 percent better than in 1981), CIT-ALCATEL is proving the vitality of the group headed by Georges Pebereau. The only fly in the ointment: the problems of two overseas branches specializing in mail handling and reproduction: Friden in the United States is losing $3.5 billion and Roneo in Great Britain announces a 70-billion franc deficit.

The group achieves 42 percent of its total sales in public telecommunications, a sector in which CIT-ALCATEL dominates the world market of temporal switching with E 10 waves. The first E 10S telephone exchange conforming to American standards was installed in Monrovia in 1982; a second will be put into operation next month. The fact remains that the French group's share of the total number of telephone lines in service in the world is only 3 percent, compared with 22 percent for AT&T, 12 percent for ITT, 8 percent for Siemens and another 8 percent for Ericsson. Its technological lead in ground communications is a first class asset for strengthening its positions in this market, which is expected to grow 8 percent a year in volume in the next 10 years.

To keep this advantage, CIT is intensifying its research efforts in optics, electronic optics and optical components in order to get ready for the imminent technological revolution that will see the light of day by 1990 or 1992; that of optical communication after the emergence of digital systems for the integration of services (RNIS) in 1986-1987. Moreover Georges Pebereau feels that the deregulation of AT&T in the United States constitutes an historical opportunity in the American market, but that the now free access to the American giant's world market represents a thumping "challenge." And the mergers that are being drafted between AT&T and Philips, as well as the agreements reached by IBM with Mitel and Rolh, "puts the competition threshhold up very high," points out Georges Pebereau.

Under the formal designation, CIT-ALCATEL comprises private telecommunications (9 percent of the consolidated business volume) and mail handling (15

percent of the consolidated business volume). In this sector, CIT is planning to increase research and overseas distribution. Its branch Telic, which now manufactures 1,500 minitels a day, is the world's biggest producer of videotex terminals.

Finally, in addition to commercial electronics (15 percent of the business volume), CIT-ALCATEL is also present in computer services (9 percent of the business volume), with GSI-ALCATEL and SESA [Society for the Study of Automatic Systems] of which the group now holds 52 percent of the capital.

The group, which unites more than 50 firms, approved a five-year plan that seeks to maintain its telecommunications capabilities, expand them into related areas, and enlarge its international positions. Two major goals translate this strategy into figures: to ensure a 20-percent a year increase in the business volume and raise the amount of activity abroad from 30 to 40 percent, with investments in the amount of 5 billion francs over five years and research and development efforts corresponding to 12 percent of the annual business volume.

It should be noted that, during this period, 1.5 billion in investments will be devoted to acquiring firms. On this subject, Georges Pebereau states that the entrance of CIT-ALCATEL into the electronic typewriter market with Olivetti is still under study.

9064
CSO: 3698/417

'SOL' PROJECT AIMS TO KEEP FRENCH IN SOFTWARE MARKET

Paris MINIS ET MICROS in French 14 Mar 83 pp 41-45

[Article by Dominique Girod: "The SOL Project: A Requisite for the Survival of the French Software Industry"]

[Excerpts] The SOL pilot project is highly topical right now, and the subject of heated discussions. As always in such cases, one position is that of the pessimists, who believe that SOL is merely a research project which will never reach the market. On the other side are the optimists, who think that SOL is the only way for France to obtain the indispensible software tools that will help it retain a leading position in the software industry. In order to get closer to the truth, the writer of this "viewpoint article" has asked the project's major contributors to elaborate on their positions.

The SOL project was initiated by the Data Processing Agency in 1979. Its objective is to develop a portable fundamental software environment which will include compilers for the PASCAL programming language, a time-shared operating system compatible with the UNIX system but written in PASCAL and a group of basic utility programs necessary for the system's operation, also written in PASCAL.

Editor's note: We have already discussed the SOL project in our issue No 168, and the critical points we raised at the time remain valid today, even though the project has progressed since then. We could summarize our reservations by restating that in our opinion, the project provides a poor match between the selected language (PASCAL) and the chosen operating system (UNIX). We could add that that the project is handicapped by other factors of a less technical nature: SOL is presently not documented, which is inconvenient at best, and writing the documentation will require a long time; and it arrives long after UNIX, with which it attempts to compete (are they trying to reinvent the wheel?). Our readers will have understood that we stand in the pessimist camp. The optimists can tar and feather us when they will have proven that they are right.

United for Strength

The SOL project is developed on the neutral territory of INRIA (National Institute for Research on Data Processing and Automation) by teams from data processing engineering companies: STERIA (Company for Data Processing and Automation Manufacturing), Syseca, CERCI (Company for Industrial Cybernetics Studies and Manufacturing), Eurosoft, Sema, as well as INRIA itself. "The SOL project is not the work of a few third year doctoral candidates," states Michel Gien, SOL project executive, in answer to detractors. "Nor is it the work of a research team," he adds, pointing out that "researchers sometimes censure the project for its industrial character."

"The advantage of SOL is that it brings together at INRIA, some forty engineers and researchers from different companies and laboratories, to develop a common software package."

The participating companies can then use this common package for their own purposes. The SOL project is not an end in itself; it must result in a pre-industrial product, and its industrialization will be left to the participating producers so that "the commercial and industrial success of this product will be in their own hands," according to Michel Gien.

A Language and an Operating System

The aim of the project was to provide French researchers first of all, and the data processing community afterwards, with a common programming language and operating system such that the community will be able to exchange a maximum of information. Hence the idea of starting with internationalally acknowledged standards. The project thus has a language aspect and a systems orientation. "The language matter was easier to resolve than the systems one, both from a political and from an industrial standpoint," comments Michel Ritout, director of research and development at STERIA, adding that "we have adopted the PASCAL language because it is unanimously recognized and because it has an ISO standard. The C language on the other hand, is not standard. The operating system problem is much more complex. Since there is no existing ISO standard, the idea was to take a de facto standard, UNIX, and write an equivalent in PASCAL. Michel Ritout stresses the fact that UNIX, used at first in the research environment, has now spread far beyond it: "The SOL project had to expand beyond the research boundaries and address itself to industry, changing the magnitude of the problem. From that point on, the applications field had to be broadened by offering complete compatibility with UNIX."

PASCAL, a Technical Choice or a Circumstantial Choice

Was PASCAL selected solely for its qualities? That does not seem to be the case. As we have indicated above, PASCAL was chosen at a time when it was widespread in all research laboratories, while the C language was practically unknown. But the selection of PASCAL is also a strategic one: "The SOL project is an industrial policy operation at the national level. The interest

of this project is also to achieve national independence: no foreign license, no constraints, no embargo, and so on," states Michel Ritout. The PASCAL option can also be considered as a challenge, deliberately selected to demonstrate the feasibility of a UNIX in another language than C, which is used in research laboratories but much less in the industrial world.

Where Are We Today?

There is no doubt that 1983 will be a decisive year for the SOL project. During the next six months, or by the end of 1983 at the latest, the project participants will have to prove that the solution is viable both from a technical and a commercial standpoint.

The question that many observers are asking, is where are we today?

Michel Gien does not deny that there is a delay of a few months with respect to the initial schedule, and that a pre-industrial solution will be operational only during 1983. Michel Ritout adds the following: "In terms of language, the SOL project can be considered as finished. PASCAL compilers are operational or about to be, for the Mini 6, the Micral 9050, the Transac machines, and the NS 16000. The SOL PASCAL compiler for Mini 6 is under evaluation at ten locations, and will enter its sales phase. The SOL PASCAL compilers for Micral 9050 and Transac are in the industrialization phase and will be operational by mid-1983. As for the NS 16000, the SOL compiler will be available in the fall of 1983." He adds that the operating system is not yet completed, but that it will be during the year.

Francois Minel comments that "we are doing all our SOL development on an SM 90 microcomputer," (a machine designed by CNET-National Center for Telecommunications Studies-around the 68000, which we described in our issue No 173). "On this machine we have run SOL utilities written in PASCAL with UNIX (written in'C), thus proving PASCAL and C's easy cohabitation, with performances that are far from ridiculous. The second stage, which will take place in the spring of 1983, is the replacement of the UNIX kernel with SOL." And offering us a demonstration at Printemps Informatique (Spring Data Processing Show), he adds: "At Thomson, the SOL developments are not taken lightly. We are also working with Thomson-Efcis on a machine built around the 68000 with VME cards, whose operating system will be SOL. This system should be presented at Sicob. Cimsa, the military data processing division of Thomson, is developing a real time kernel around SOL."

Michel Fraval, director of industrial policy and technical development at Eurosoft, indicates that "Intertech is developing a SOL machine with microprogramming, in the same way as Western Digital designed a PASCAL machine (the Pascaline)."

Jean-Pierre Baconnet, technical director of CERCI, states that "CERCI is interested in the SOL project at three levels: as an environment for developing and maintaining software in an industrial manner; for training engineers;" (operating systems and compilers are not created every day) "and

for office automation." According to him, the SOL environment lends itself very well to office automation, which is one of CERCI'a areas of interest. "The implantation of SOL in the Mini 6 is interesting in this respect, and then only if CII-HB adopts SOL so that we can foresee office automation developments with it," he adds.

Compatibility with UNIX: Fervent Wish or Reality?

According the Michel Gien, SOL is totally compatible with the UNIX system. A programmer will be able to indistinguishably run the same program on a SOL kernel or a UNIX kernel (on the same machine), and users will find the same commands on SOL as on UNIX. The added value of SOL rests in its portability, in more readable kernels and utilities, as well as in improved reliability and the assistance offered by the system to users who need it.

Michel Ritout does not conceal the difficulty of the enterprise: "The SOL problem became complicated by the need for full compatibility with UNIX, because compatibility beyond the kernel alone also involves the utilities and must allow the recovery of application programs." He believes that in the absence of a universally accepted standard definition, the initial version of SOL is compatible with version 7 of the system distributed by Western Electric. A C compiler will soon be available under 68000 SOL, which on the SM 90 will allow the transfer of software written in the C language in the United States. PASCAL does not pretend to be the only language available on SOL; it is merely the language used to write the kernel of the system, and the one which assures its transferability.

Michel Gien emphasizes this C-PASCAL complementarity at the SOL level: "Application programs written in C and in PASCAL will run on SOL." The absence of a UNIX standard is far from simplifying the task of SOL's designers. Michel Ritout, in turn, believes that SOL's distribution depends on UNIX. Will there be a UNIX standard, or not? That is the problem.

Market Control Achieved Through Exportation

"Buy French," "regain the domestic market," are slogans that we hear every day and that should work to SOL's advantage. But will it? Most of those with whom we spoke hope so, although they express some doubts: "The French manufacturers of data processing equipment are the first to demand massive acquisitions of their equipment by the French government, but they are also the first to turn toward the United States when they need software," are what we have often heard from various service companies. Except for Intertechnique, the computer manufacturers have not shown much interest in this project. However, "the manufacturers' role in a large one," asserts Jean-Claude Fraval, adding that "beyond the common package which is not yet stamped by the target machine, there is the code generation problem, and more generally, the implementation problems, which are indubitably stamped by the target machine and by the product policy of the manufacturers."

Is the decision of one or several French manufacturers in favor of SOL indispensible for its promotion abroad? "Yes" is what all those whom we interviewed unanimously said, adding that "we cannot hold discussions with foreign partners if we have no references in France." Are all these arguments sufficient to explain a certain lack of commercial and marketing agressiveness for SOL? Would not American companies specialized in PASCAL (such as Sofitech), or PASCAL oriented microprocessor manufacturers (such as Motorola or National Semiconductor), be interested in a UNIX written in PASCAL? "That is not the role of the pilot project," says Michel Gien, adding that "it is incumbent upon us to provide pre-industrial products. The transition to actual industrial products, as well as the promotion and sale of this product, are in the hands of the industrialists participating in the project."

Michel Ritout insists on the fact that the project involves a joint group of partners, and that this is an industrial policy operation at the national level. Philippe Oziard responds by saying that "the Data Processing Agency cannot take the place of industrialists. A GIE (Economic Interest Group) or equivalent group, combining the Data Processing Agency and participating companies could be a solution for marketing."

Jean-Claude Fraval summarizes the situation very clearly by asserting that if SOL's objectives are to create the conditions for national independence, it can be said at this point that these objectives have been met, except for the industrialization delay. If on the other hand, the project's objectives are to offer the entire world a French industry alternative to the large American suppliers (Digital Research, Microsoft, Bell, and so on), the distribution hurdle still remains to be crossed, together with the policy of applications products operating under SOL. "The latter point requires an all-out industrial policy in all directions with national manufacturers, distribution networks (Computerland, Lifeboat, Softech, and so on), American manufacturers, and application program producers, to transpose these programs for SOL."

Does SOL's success require that it be exported? A French industrialist who is not involved with SOL, recently told us that "the recapture of the French market has to go through exportation. Success in exportation automatically means large sales in France. The converse is not true." This statement certainly applies to SOL.

Project's Interest for Small Companies

For their dues (10,000 francs in 1983), Club SOL gives its members access to products (texts, sources, and complete documentation) developed in the pilot project.

The members receive free successive versions and maintenance of these products. Every club partner must submit any new product for BNI's (National Interprofessional Bureau) approval before distribution.

Club SOL is primarily intended for small manufacturers. According to Gerard Trembleau, an executive at Microprocess (industrial company whose activity is the construction of systems based on microprocesss), "membership in the club gives us the technical means to immediately install an operating system around the 68000 microprocessor in France and Germany, without constraints (royalties, licenses, and so on)." To which he adds: "American companies have offered us operating systems for the 68000 at exhorbitant prices which small European manufacturers cannot afford. Only the large groups can pay for such operating systems." He also stresses the fact that "SOL is a keystone in the development of Microprocess," a company which is one of the rare members of Club SOL that does not specialize in minicomputers but rather in microcomputers. It should be pointed out that Microprocess has already included SOL in its 1983 systems catalog. Moreover, the Microprocess training department is organizing a course for SOL products during the second half of 1983. William Kazuro, another Microprocess executive, goes on to say that "Microprocess strongly depends on the membership of industrialists in the SOL group, and hopes that they will play an active role in its promotion. As for us, we have obtained the membership of the German company Weiss, which will take charge of SOL's distribution in Germany."

What are the club's objectives? According to Philippe Oziard, its ex-president, six objectives have been established: promote the dissemination and use of standards developed as part of the project; promote the dissemination and use of computer products conforming to these standards; assure the growth of these standards and of associated products in a concerted and coherent fashion; allow and promote the use of products conforming to SOL standards in research and education; coordinate the development of software conforming to these standards; and assure exchanges between SOL suppliers and users.

The club's coordination of installations among suppliers (in various capacities) and users of SOL products should make it possible to assure the cohesiveness of all the elements forming the software engineering foundation created by the pilot project (common package of compilers and operating systems, PASCAL compilers, operating systems, program development tools, and so on).

SOL is thus an ambitious project, whose objective is to provide France with the indispensible software tools that would help it retain its leading position in the software industry, on condition that the product is viable both technicaly and commercially.

Do we have the means and especially the will to develop this policy that goes beyond the mini market to reach the much larger and more promising market of the 16-bit micros. We have lost the software battle for 8-bit microprocessors. Will we win that of the 16-bit machines? The future will tell, but we must not forget that the greatest risk is not to take a chance.

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CSO: 3698/432

BRIEFS

SIEMENS 1983 FISCAL YEAR--Siemens is showing after-tax profits of DM538,000,000 (464,000,000) for the first 9 months of the current fiscal year that expires 30 September. As before, the concern lacks an adequate work force in most of its operations. The number of employees could not be maintained: worldwide, it declined by 4 percent to 311,000 (the domestic decline was 5 percent, and abroad it was 3 percent). With DM1.1 billion, investment again reached the level of the previous year. At DM35 billion, incoming orders were 13 percent greater and worldwide sales of DM28.2 billion were 3 percent greater than the previous year. Domestically, incoming orders rose 46 percent to DM18.1 billion, mainly because of two large orders in the power-plant business. Excluding this special influence, the increase was 7 percent. With DM16.9 billion, incoming orders from abroad remained 9 percent below the figures for the previous year. That can be accounted for by the persistent stagnation in most industrial countries, balance-of-payments problems in important customer countries and the slowed development of the infrastructure of some oil countries. At DM59 billion, unfilled orders were 11 percent higher than in mid-1982. The trend for incoming orders was different in individual areas. The weak inclination to invest prevailing in many countries was felt most strongly in energy technology. Communications technology was able to increase incoming orders slightly over the previous year. Data technology and medical technology achieved above-average growth. Sales increased 5 percent domestically to DM12.5 billion; foreign sales increased only 2 percent to DM15.7 billion. With double-digit growth rates, data technology and medical technology also had the greatest increases in sales. /Text/ /Duesseldorf VDI NACHRICHTEN in German 19 Aug 83 p 15/ 9746

NEW LETI/CENG SENSOR--Based on a field-effect transistor. A major breakthrough in the sensor industry. These sensors consist of a field-effect transistor whose gate metallization has been eliminated. The gate oxyde is directly exposed to the solution to be studied or covered by a selective membrane (ion-sensitive material) in contact with the solution. At the membrane-solution interface, a potential difference is created, which follows Nernst's law and modulates the value of the transistor drain-current source. Advantages of the sensors: miniaturization (chips less than 1 square millimeter); sturdy devices existing in two versions, rigid or flexible; insensitivity to mechanical impacts; fast response; ease of processing; high sensitivity; low cost (large-scale production). Their applications: innumerable. Industry: measurement of physical and chemical parameters; process automation; measurement of air and

water pollution. Medicine: medical analyses; surgery; kidney dialisys; prostheses; microbiology; immunology. Research: measurement of ion concentration; biochemistry and biomedicine. Present status: prototypes sensitive to the K+, Na+, CA+ and H+ ions made by LETI [Data-Processing Technology and Electronics Laboratory]/CENG [Grenoble Nuclear Research Center]. Can be made by any manufacturer with expertise in integrated circuit technology (oxidation, diffusion, layout, deposits, evaporation, protection...). Development status: patents, especially in the United States. [Text] [Paris INDUSTRIES & TECHNIQUES in French 20 Mar 83 p 136] 9294

CSO: 3698/445

FRENCH FIRM DEVELOPS NEW PALLETIZER INSTEAD OF BUYING JAPANESE

Paris INDUSTRIES & TECHNIQUES in French 1 Mar 83 p 67

[Article by Andre Larane: "A Four-Position Palletizer for the Machining Center"]

[Text] To Machine Successively Four Different Parts of the Same Set

Poitiers isn't the only place.... At Chateaudun too they're putting up resistance to the Japanese invaders, and in a very sound way: by innovating. The New GSP Company has just created a four-position palletizer. It makes possible the successive machining of different parts at the same machining center. That is of interest to the consumer, most of all when he has to process a set consisting of several elements. Instead of machining the first element and then storing it before going on to the next one, he puts the unfinished parts of a complete set on the pallet loader. Upon completion of their machining they go straight to assembly. No more intermediate storage and no more delays.

In the Shape of a Swastika

But there are other ways in which the center foreman profits from the four-position palletizer even when machining a simple series. He doesn't have to load three unfinished parts to wait for machining. This way he keeps his hands free longer. It is to be noted that this palletizer gives the machine tool a greater autonomy than the two-position palletizer previously developed by the Chateaudun company. In both cases the shaving removal time is maximal.

Swastika-shaped, the four-position rotary pallet loader is placed at the right front of the stand. It turns on its axis to come in contact with the pallet and grasps it by means of special catches. By means of a 45 degree rotation a new pallet is led over the stand. But for GSP it is not enough to have conceived this original system. Machining several models without human intervention requires a corresponding apparatus for distinguishing the parts. So before any machining takes place an electronic feeler is taken out of the tool shop. It recognizes the unfinished part and calls the number of the corresponding program. This principle does not present any adjustment difficulties. The Chateaudun manufacturer has already sold centers

equipped with Renishaw feelers for the correction of tool length and the balancing of unfinished parts. In the small machining center field, which has been heavily encroached on by the Japanese, GSP has had the ability to carve out a good share for itself. Each month it sells approximately four vertical-shaft centers and the same number of horizontal-shaft centers. Its two- or four-position loaders are offered as an option for machines equipped with a rotating 500 mm-diameter table. A dozen machines with four-position palletizers have already been ordered. Approximate additional cost of the loader: 100,000 francs. The first is ready to operate at a factory which makes electronic pick-ups.

The company is also studying a robot which would lift out tools from a rack of unlimited capacity next to the machining center. In fact the operation of several machining programs makes necessary a broad range of tools, exceeding the 30-tool capacity of GSP's standard shops. The prototype will be presented in June at the European Machine-Tool Exposition in Paris.

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FRENCH, BULGARIAN MATERIALS HANDLING FIRMS FORM PARTNERSHIP

Bern TECHNISCHE RUNDSCHAU in German 8 Mar 83 p 36

[Article by Helmut Altner: "Bulgarian State Corporation Eliminates U.S. Firm From the Competition"]

[Text] The French materials handling industry, which has been strongly affected by the economic crisis, can be strengthened in the face of significantly increased foreign competition only by a restructuring and possibly by close cooperation between individual firms in the production of common components. This was the recent statement of a leading personage of the French Ministry of Industry, which fears that the French materials handling industry could be pushed by the Japanese out of third place in the world ranking (behind the United States and the Federal Republic). The industry has had to deal with significant problems in recent years, causing many small companies to go out of business while the large enterprises have had increasing difficulties, especially in the area of floor handling vehicles, where the foreign market share has climbed from 30 to 55 percent in recent years. Among the large enterprises which were able in the early seventies to win a leading position through mergers with small companies is Fenwick-Manutention, which employs 1,760 people in 3 plants and realizes a turnover of over 760 million francs.

Along with Matral Saxby and Manitou, Fenwick is one of the leading French manufacturers of floor handling vehicles. The company has had problems since 1974. In the last 2 years its situation has reached the point that it has needed significant bank subsidies to sustain it. In 1981 it recorded a loss of over 76 million francs, while last year's deficit is said to be considerably over 50 million francs. In the fall of 1981 Fenwick had already asked the Ministry of Industry for support and proposed a restructuring involving the taking on of a new partner. An investigation by the Institute for Industrial Development (IDI) showed that the company could not survive without a strong partner. A first project provided for massive participation by the major government bank Credit Lyonnaise and the IDI. The British group Lancer Boss, the French company Saxby, a subsidiary of Ascinter-Otis (branches of the U.S. company United Technologies), and the Bulgarian Balkancar offered themselves as possible partners.

After the administration had at first planned for a takeover by Saxby, a company which is moreover in the black and holds the second place among the French manufacturers of floor handling vehicles, the Ministry of Industry surprisingly declared itself for the participation of the Bulgarian company. The deciding factor was evidently the fact that Saxby (like Lancer Boss) wanted in case of a takeover of Fenwick to lay off several hundred workers and close plants in order to concentrate production. The Saxby solution involved the establishment of a holding company in which Otis and Jeumont-Schneider wanted to participate at 31 percent and 20 percent, respectively. Forty-nine percent of the capital was to be held by a bank pool under the leadership of Credit Lyonnais.

U.S. Concern Doesn't Give Up

But the administration chose the Balkancar solution. This Bulgarian company, the largest manufacturer of floor handling vehicles with a production and sales monopoly in the Comecon countries, will not, however, be able to assume the desired majority share of the enterprise. It will merely have the possibility of approximately a 30 percent share, the rest being held by government banks and/or public enterprises. The decisive factor in this decision was the fact that Balkancar wants to trim only about 250 workers from Fenwick, that it wants to produce components for floor handling vehicles at a very favorable price which will make possible a significant improvement in competitiveness, and finally that significant sales possibilities would open up to the French company in the Eastern bloc through the Bulgarian company.

This would be the first time that an Eastern bloc country had acquired a direct share in a French enterprise. This solution has provoked surprise in French economic circles, even though Balkancar wants to retain more jobs than Saxby intended to retain. The question arises here as to whether political considerations could have played a role in preferring an Eastern bloc enterprise to a U.S. subsidiary. Otis hasn't given up yet, though. It has submitted new proposals, and on the other hand many of Fenwick's suppliers and customers have declared themselves for a Saxby solution and are possibly prepared to provide a share of the capital along with Saxby.

Jeumont-Schneider is also interested in participating with the U.S. subsidiary in a new holding company to save Fenwick. Whether the administration will change its preliminary decision for Balkancar, with which it is currently negotiating over the details of the capital distribution, is uncertain. It appears certain that the Otis-Saxby proposals for the creation of a strong French group in the floor vehicle sector will be more favorable in the long term in spite of the dismissal of workers which would then become necessary and the possible closing of obsolete Fenwick plants. The "Balkancar solution" is supposed to cause fewer dismissals at Fenwick itself, but the fact that the Bulgarians want to provide components for production could have the effect that Fenwick's suppliers would have to lay workers off, thus causing an overall greater job loss than would be the case with a takeover by Saxby or the English Lancer Boss group.

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CONTINUOUS CASTING UNIT MAKES RODS OF MOLTEN STEEL IN 2 HOURS

Paris INDUSTRIES & TECHNIQUES in French 1 Mar 83 p 30

[Article by A. P.: "From Molten Steel to Rods in One Operation"]

[Excerpts] A Centrifugal Continuous Casting Process for Special Steels. 300,000 Tons per Year.

When French iron metallurgy innovates in the area of production techniques, it doesn't do things half-way. Usinor has just put into operation a centrifugal continuous casting unit for special steels. The investment is significant: 200 million francs. The result is impressive. The molten steel is transformed directly into rods about 30 centimeters in diameter. These intermediate products are to be used essentially in the manufacture of unwelded pipes. The equipment was set up at the Dunes factory near Dunkirk.

At Dunes they expect to produce 700 different gradations with the new machine. But the most striking achievement is the speed of production. Two hours after casting the rods are ready for shipping. The Dunes equipment consists of three main parts: the hot-vacuum ladle refiner, the centrifugal casting machine and the rod finishing workshop. The pocket refiner effects the final gradation. It contains 75 tons of molten steel per casting maintained at temperature by three electrodes.

Casting: 90 Minutes per Ladle

The refining operations are carried out in a vacuum. The goal of the operation is three-fold: final grading by metallic additives, venting of the steel during working, and reheating of the mixture to compensate the drop in temperature. The mixture is agitated with argon to facilitate venting and improve homogeneity. Each ladle is treated for 45 minutes. At the end of this operation it is raised to a height of 25 meters. To the level of the upper floor of the continuous casting channel.

It is here that the casting truly begins. It lasts for 90 minutes per ladle. Three hours before pouring, the moulds of the required diameter have been put in place; 45 minutes before pouring the preheating of the distributors begins. On the lower floor everything is ready to receive the finished rods. Their diameter varies between 150 and 290 mm as required.

The molten steel is poured into a distributor. This feeds four water-cooled moulds made of chrome-plated copper: 150 cubic meters per hour. Just before casting a false rod (dummy) is put in place. It is fixed in the rod during solidification. It is this rod which guarantees the start of the extraction process. The moulds and the rods turn at a speed of 35 to 50 revolutions per minute. The cooling and the rotation form an outer skin which keeps the interior of the rod molten.

During the first part of the descent (4 meters), the semisolid rods are fully cooled by a set of vaporizers: 35 to 40 cubic meters of water per hour. Six meters lower, the rod is solid enough to be gripped by the rotary extractors which feed the rods downwards. The last operation is cutting to order. The rods are then returned to a horizontal position and moved out toward the cooling units. The capacity of this installation is 300,000 tons per year. The bulk of this production (250,000 tons) will be made by Vallourec into unwelded pipes. The rest will be used in the manufacture of laminated rods.

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COMPOSITE MATERIAL USED FOR SNIAS DEEPWATER CYLINDER

Paris INDUSTRIES ET TECHNIQUES in French 10 Mar 83 p 32

/Text/ /Excerpt/ The purpose of recent operations carried out on underwater equipment containers performed by the National Aerospace Industries Company (SNIAS) was the finishing touches on an overall method of computation applicable to cylinders of wound composition material for water depths reaching 6,000 meters. In an early operational phase (target: 1,000 meters) designed to test the method, the materials chosen were glass and carbon, both impregnated with an epoxy resin. Two technologies were utilized: one consisting of using winding to put together cylinders having a smooth inner surface, the other consisting of cylinders with inner surface reinforced by inside framework, also wound. These trials showed the best performance by the reinforced inside surface and a savings in weight in comparison with steel reaching as high as 30 percent for glass and 50 percent for carbon. For the second phase of the trials (target: 6,000 meters), the carbon-epoxy resin compound was chosen along with the wound, smooth interior surface technology owing to simplicity of manufacture and the small diameter produced (210 mm). But glass may be used in the future, and the stiffened inside surface will find specific applications. The features of shells so constructed are excellent. A smooth carbon shell 210 mm in diameter and 900 mm in length, at a composition weight of 23 kg, offers buoyancy of 0.51 (weight of composition/volume of water displaced) and pressure resistance of 813 bar.

Although the cost of development of composition materials is generally higher than for standard materials, the energy scorecard is nevertheless favorable to them. The filament winding technique which allows putting together rounded shapes automatically simplifies the manufacturing cycle. It allows us to work toward multiple applications: containers for electrical and electronic equipment, offshore underwater gas storage tanks....

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BRIEFS

ROBOT FOR UNDERWATER PIPELINE REPAIRS--The Maritime Appraisal Company (COMEX) has just put together a one-of-a-kind robot able to make repairs to underwater pipelines at a depth of 1,000 meters. Weighing 200 tons, it will be able to change the defective part of the pipe automatically. It will belong to the "Deep-sea Repairs" arsenal currently being implemented by COMEX in collaboration with the French oil companies "Total" and "ELF." It was manufactured by the Gensollen Company, located at Pennes Mirabeau in Bouches-du-Rhone department. /Text/ /Paris AUTO-INDUSTRIES in French 1 Sep 83 p 10/ 9436

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voucher is printed out. The following steps will shortly also be automized to a large extent at Airspares. The new high-shelf warehouse in the roughly 3,800-square-meter extension is to be equipped with an automatic materials handling system in the near future. The process-computer-controlled storage installation permits, among other things, taking out of storage a week's production for shipment ahead of time. Ie the case of urgent requests the installation guides the required part automatically out of the queue for immediate processing.

"A spare parts service," as Peter Triep formulates the way Airspares sees itself, "can work only if it works one hundred percent." And this finds expression in the flight take-off reliability of the fleet. The more than 200 airbuss planes in operation worldwide achieve a 99 percent reliability in use. Statisticians speak in such cases of "probability bordering on certainty."

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FRENCH FIRM DEVELOPS SUPERCHARGED DIESEL ENGINE

Paris L'ARGUS DE L'AUTOMOBILE in French 31 Mar 83 p 10

[Article: "Hyperbar: A Major Breakthrough in Supercharging"]

[Excerpts] Is it possible to double or triple the power output of a diesel engine without running into problems? This exceptional performance is now made possible by the Hyperbar system, a French invention which is revolutionizing the technology of large diesel engines. Let us admit it: it is a pleasure to see a small French company--40 engineers and technicians based in Trappes, near Paris--find a place among the leaders in technology, and arouse the admiration of the most famous engine manufacturers of the time.

To improve diesel efficiency, the turbine must be made absolutely independent from the diesel; in other words, it must have a degree of freedom with respect to the engine.

By-pass and Valve

This simple basic idea (all the same, someone had to hit upon it!) was materialized--a stroke of genius--in an equally simple way by Jean Melchior. Instead of supercharging in series, he used a parallel configuration. To give the turbosupercharger the required degree of independence, he added a direct by-pass between the intake pipe and the exhaust pipe.

Thus, part of the compressed air need go only a very short distance to "assist" the exhaust gases in accelerating the hot turbosupercharger turbine. As a result, the turbosupercharger rpm increases faster than it would using the diesel hot gases alone. The turbosupercharger having a higher rpm, the diesel engine is more highly supercharged and responds more rapidly... and so on. However, the degree of liberty which the by-pass gives to the turbosupercharger is not without danger. For instance, if the exhaust gas pressure P_2 exceeds the intake pipe pressure P_1, the by-pass operates in the reverse direction and draws back in the exhaust gases. Therefore, a relief valve is installed on the by-pass to provide a loss of charge sufficient to ensure that pressure P_1 will always exceed P_2. Actually, the relief valve creates a retention which is a function of supercharging.

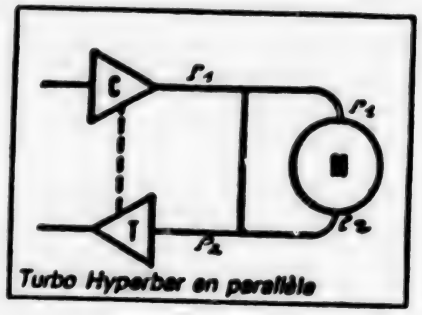

Figure 1. Hyperbar Turbosupercharger Parallel Configuration

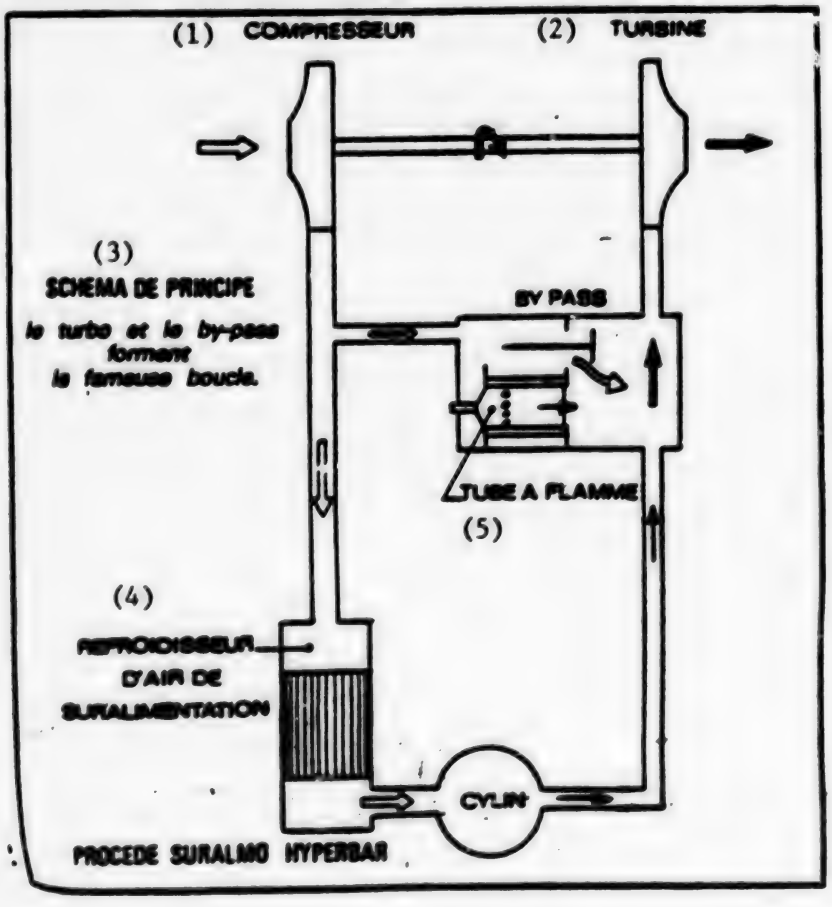

Figure 2. Hyperbar Suralmo Process

Key:
1. Supercharger
2. Turbine
3. General Principle Diagram (the turbosupercharger and the by-pass form a loop)
4. Supercharging Air Cooler
5. Flame Tube

The safety provided by the relief valve should not let us forget two problems:

- limits must be set to the performance of the system thus "doped";

- the system must operate properly at a low rpm.

The Burner

To prevent excessive pressure from building up in the engine, the compression ratio must be reduced. A ratio of 7/8 will provide the safety required but the second problem then becomes somewhat more complicated: starting becomes a problem and self-ignition (the basis of diesel operation) becomes difficult for low rpm values.

As is, the supercharging system with its by-pass provides inadequate performance. The trick used by Jean Melchior is to circumvent the problem by providing the by-pass with an auxiliary chamber that may be used to burn fuel if desired. This chamber receives air from the by-pass and sends hot gases to the receiving turbine of the turbosupercharger which then provides a high flow of compressed air to the engine, even if the engine is idling. Thus, for low charge values, the turbosupercharger output is totally independent from the engine. A closer look at Figure 2 will show that the system including the supercharger, the burner and the supercharger-driving turbine actually amounts to the gas generator of a turbine and, therefore, can operate alone if desired.

In other words, the Hyperbar system is the--clever--combination of a diesel engine and a parallel-mounted turbine. The independence of the turbomachine with respect to the diesel is perfectly controlled since the secondary chamber is provided with a clever system that can move it forward or backward as a function of the intake pressure, the latter being "corrected" at will by adjusting the relief valve.

A Difficult Start

The system designed by Jean Melchior is certainly complex, but it does not take much room. Its main advantage is that it will usually double the power output of the engine on which it is installed. However, much work was required to go from theory to actual use on "industrial" engines: a development team had to be set up to carry out the project. This was beyond the scope of research carried out by the army and the latter, unable to find an industrial partner, encouraged Jean Melchior... to return to civilian life and create a research and development company for the Hyperbar system. He was also given permission to use the patents already filed, a point of major importance in this case. Unfortunately, once again manufacturers did not rush to help Melchior... It took the intervention of two well-advised engineers, Messrs Grosseus and Cllier, to enable the Hyperbar company to be created in 1972. Founders of the Grossol Company, specializing in large diesel engines, these engineers had especially liked Jean Melchior's idea... which worked perfectly on their engines. After the necessary calculations, a first Hyperbar system was built from scratch, using recycled aircraft components: this laboratory makeshift assembly worked perfectly because the system regulation was done by hand.

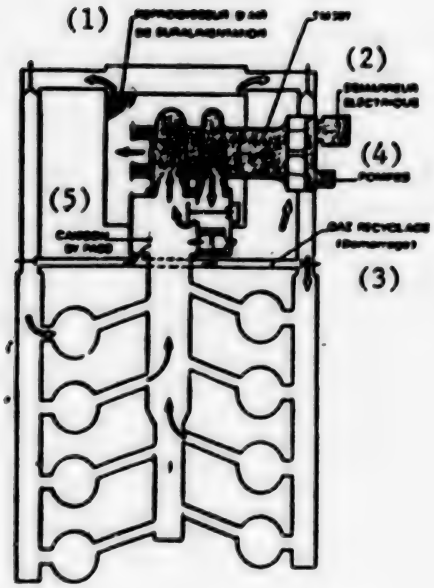

Figure 3. A Typical Application, the V8S3: The Turbosupercharger Is Started Electrically

Key:
1. Supercharging Air Cooler
2. Electric Starter
3. Gas Recycling (Starting)
4. Pumps
5. By-Pass Box

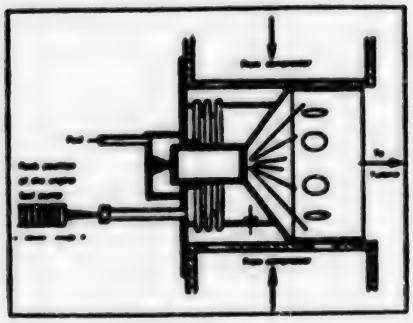

Figure 4. Automatic Regulation of the Chamber, Mounted on Bellows: the Higher the Pressure, the Greater the Advance of the Chamber, and the More Fuel it Gets to Burn

Thus, the army had met the challenge--finding an industrial relay to develop a promising invention--thanks to Jean Melchior and Jean Ollier's persistent efforts. A huge amount of work was still required to improve the system.

Huge Advantages...

The Hyperbar system, therefore, is characterized by a very high degree of supercharging and a very low compression ratio. As a result, the combustion taking place in the cyclinder gives off a lot of calories (since there is a lot of air), but it is relatively slow (because of the low compression ratio). If we compare the pressure diagrams of the Hyperbar engine and a traditional supercharged engine, we note that the maximum pressure is practically identical and that it decreases very slowly. As a result, piston pressure on the crankshaft is much better distributed during the power stroke, as the difference between the maximum pressure and the average pressure tends to get smaller. Paradoxically, the Hyperbar engine provides a higher power output with less fatigue for the lower engine! This makes it possible to adapt the system on practically all diesel engines without any alteration of the engine block or the connecting rod assembly, the engine flywheel alone having to be strengthened to transmit the markedly increased torque: this is a major marketing advantage which Hyperbar and its licensees are beginning to exploit. Thus, the Grossol V8-520 naval engine which has a power output of 236 hp under atmospheric pressure, has a power output of 1,200 hp with the Hyperbar system, although the engine capacity remains the same (13,970 cc). For identical power outputs, the cylinder area is two to three times smaller than for a traditional 1,200-hp engine. This, added to the excess air flow provided by the very high degree of supercharging (which cools off the cylinder walls) reduces by half the size of the cooling system required. Thus, for an identical power output, a Hyperbar engine will be much smaller than another engine, and so will its cooling system.

... In Every Respect

Another advantage of the Hyperbar engine is that its "loop" can work alone. The turbosupercharger and the chamber form a turbine that can be used to drive electrical and hydraulic equipment... even when the diesel engine is not working. The Hyperbar "loop" can therefore be used instead of an auxiliary power unit. Hot "loop" gases provide an instant cold start of the diesel engine despite the low compression ratio: all it requires is to mix the hot gases with the cold intake air.

Finally, the "burner" being always lit, the diesel engine can idle, which is impossible in a traditional engine.

To summarize all these advantages, we need only compare the Hyperbar V12M3 with its direct competitor, the German MTU engine which is also used on fast patrol boats. For the same power output (1,300 hp), the Hyperbar engine weighs one ton less, is one meter shorter, and does not require an auxiliary power unit (one ton) for low-speed navigation.

One Kilo Per hp

Does this marvel have any fault? In theory, it should have one, and a major one:

- a high fuel consumption because of the very low compression ratio and because fuel is burned in the additional chamber.

But experience has shown that it was not so. With a 12-and-7 compression ratio, the theoretical power output reduction is made up for by the improved mechanical efficiency and decreased losses through the cylinders. As for the effect of additional consumption, it is practically nil at low rpm, except when the engine is idling, when the consumption is then three times that of an engine of similar power output; however, as we have seen, navy ships no longer require an auxiliary engine, so that the overall balance is identical. Apart from that, the Hyperbar engine is no miracle: although it is smaller, its consumption is exactly proportional to its power output. Its final advantage--a major one in designing the vehicle around the engine--is the fanstastic weight/power ratio of the Hyperbar engine, which is equal to one. For a large naval diesel engine to boast of a ratio of 1 kg for 1 hp, like any old 6-cylinder 24-valve Toyota gas engine with electronic injection and ignition, is an unheard of performance and a legitimate source of pride.

Further Progress

Since 1972, Jean Melchior and his team have kept working in two directions:

- improved performance
- improved flexibility and reliability.

Actually, they had to pioneer in a new field, very high supercharging, while retaining an "industrial" degree of reliability in the engines thus altered: that was the price to pay for credibility. Considering the lifetime of diesel engines of this type, we should not be surprised to learn that it took Hyperbar 8 years to test 50 prototypes of 15 sizes, from 500 to 15,000 hp. Although research goes on (and in other, just as innovative, fields as well), the "pre-industrial" stage is expected to start in 1985.

After looking at the amazing qualifications of Hyperbar engineers, after seeing their six huge test benches, the many minicomputers used at Trappes, one wonders how such a company can operate and invest, and plan on being ready by 1985! This is because 50 percent of its capital is owned by CEM [Electro-Mechanical Company] (a subsidiary of Brown-Boveri, the famous Swiss turbine manufacturer) and because the company already has 8 licensees throughout the world.

Their names are kept secret... except for those who acknowledge their cooperation with Hyperbar. In France, SACM (Alsatian Mechanical Engineering Company) and SSCM (Saint-Etienne Mechanical Engineering Company, Poyaud) also hold some of the small company's stock. In England, Rolls-Royce uses patents... that will be seen one day on engines from the five other companies. Actually, Hyperbar makes the initial prototypes, follows up on their development, then becomes the equipment supplier of the licensee to whom it supplies the systems. Its other source of revenues is provided by research and development agreements

with various companies and organizations: thus--quite logically if we consider how Hyperbar was born--the French army has entrusted it with the realization of a prototype tank engine for the 1990's. EDF [French Electric Power Company], too, has every reason to be satisfied with Hyperbar services, as does SNCF [French National Railroads Company] which has been extensively and successfully testing an engine-powered rail-car, or shipbuilding yards (in France and abroad) where customs and coastguard motorboats are made.

What Comes Afterward?

Something should be known. There is no upper or lower limit to the capacity of diesel engines that can be equipped with the Hyperbar system. Of course, because of their peculiar architecture, the SACM-SSCM engines were ideally suited to demonstrate the validity of the system, but the Hyperbar "loop" can logically be expected to be adaptable to heavy-duty propellers. In its present configuration, the chamber self-regulates through simple automatic devices or through electronic devices for a finer adjustment. Conceivably, simplified versions could be adapted on utility vehicles which would then have much smaller engines... and a much improved empty weight. Will they also be used on private vehicles? Why not? This could be possible in the future, but always on diesel engines: an unsuccessful attempt on the Renault Formula 1 engine appears to have disqualified gasoline engines for the moment.

In the meanwhile, let us rejoice as the French diesel industry finally emerges from its lethargy, thanks to Jean Melchior. May it progress again and regenerate an industrial fabric that is weakened and dominated by foreign companies, either directly or through subsidiaries!

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